

REMARKS

Priority Claim

Applicant requests that the Office acknowledge the claims of priority under 35 USC Sections 119(e) and 120. The present application claims the benefit of U.S. Patent Application Serial Number 60/170,147 filed on 12/10/1999 under 35 U.S.C 119(e). In addition, this application is a Continuation-in-part of U.S. Application Serial No. 09/653727 entitled an OPTICAL COMMUNICATION NETWORK WITH RECEIVER RESERVED CHANNEL<(Atty Dky SLM02-US)> by the same inventor, filed September 1, 2000 and now issued as Patent No. 6,674,971; and a continuation-in-part of U.S. Application Serial No. 09/653,647 entitled OPTOELECTRONIC CONNECTOR SYSTEM , <(Atty Dkt No. LSC142-US)> by the same inventor, filed September 1, 2000 and now issued as Patent No. 6,434,308. The correct priority is noted on the filing receipt dated 9/17/2001. Applicant has amended the specification accordingly herein and respectfully requests that the Office note the priority claims.

Drawings

Applicant, as noted above, herewith submits amended drawings. The Applicant respectfully requests that Fig. 10B be amended as indicated to correct an obvious error with respect to reference label 960. The specification on page 28 states that "the central node array is divided into several smaller arrays where each smaller array is optically coupled as illustrated in FIG. 10B. The central node fiber bundles 950 interconnect to smaller central node arrays enabling the larger central node 955 to operate at fiber optic speeds. The leaf nodes connections 960 of the divided central array 955 transmit optical data from the divided central node 955 through optical fiber bundles 960 to specified leaf nodes." Reference label 960 is intended to show the fiber optic connection to leaf nodes as depicted in the original filed drawings. The central node array is divided into a plurality of segments 955 which are coupled to each other by the central node fiber bundle 950. Reference label 960 has been amended in the drawing to reflect a fiber optic connection to the nodes (not shown) as depicted in the originally filed informal drawings.

The Office has also indicated that certain features, “mating fiber optic cables that are connected to a processing unit off-chip” and “a means for separating the mating fiber optic cable to enable connection to other fiber nodes” are required in the drawings or the claims need to be cancelled. The Court of Appeals for the Federal Circuit (CAFC) in *Cordis Corp. v. Medtronic AVE, Inc.*, 67 USPQ2d 1876 (Cir. Fed. 2003), notes that "drawings in the patent are merely a 'practical example' of the invention." 67 USPQ2d at 1886, citing *Lampi Corp. v. American Power Products*, 228 F.3d 1365, 1378, 56 USPQ2d 1445 (Fed. Cir. 2000).

The claims have been amended to clarify the patentable subject matter, however a brief description is also included in response to the objection of the Office. The claimed element “mating fiber optic cables that are connected to a processing unit off-chip” refers to the routing of the optical communication lines from the central array to the nodes, wherein the node is not on the same integrated circuit (IC) or chip. As explained in the present application, the node is coupled by a fiber bundle and can be on the same chip or on another chip. In one embodiment the node is also described as being more than just transmitter/detectors – the node can be another central array or a node having a processor on-board. The optical signals communicated to/from the fiber are not directly coupled to the processing unit, but rather thru the optoelectronics and optical elements that are resident with the node processing unit. The claims have been amended to clarify this relationship.

The claimed element “a means for separating the mating fiber optic cable to enable connection to other fiber nodes” refer to the dividing of the ordered fiber array 740 shown in Fig 8. The ordered fiber array is divided into a plurality of bundles which are then coupled to a plurality of nodes. The description is detailed in the present specification and known to those skilled in the art. As shown in Fig. 5, the fiber bundles establish a connection from the central array 400 to each of the nodes 410, 420, 430, 440. The optical fibers can be divided from an ordered fiber array and selected for a node fiber bundle so that a single optical fiber is routed to a single transmitter/receiver on the node, or a bundle of fibers can be optically coupled to the node. The

claims have been amended to clarify the patentable subject matter in this regard.

Reconsideration and withdrawal of the rejection is respectfully requested.

Claims Rejections - 35 USC §112 First Paragraph

The Office has rejected claim 11 under 35 USC Section 112 first paragraph for failing to comply with the enabling requirement. In particular, the Office states that the present application does not describe the 'means for separating the mating fiber optic cables to enable connection to other fiber nodes.'

The first paragraph of 35 U.S.C. 112 provides:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention. [emphasis added].

This section of the statute requires that the specification include the following:

- (A) A written description of the invention;
- (B) The manner and process of making and using the invention (the enablement requirement); and
- (C) The best mode contemplated by the inventor of carrying out his invention.

MPEP§2161

It is readily understood that the enablement requires that the specification describe how to make and how to use the invention, and more specifically, that one skilled in the art must be enabled to make and use the invention defined by the claim(s) of the application. Thus, the specification needs to describe the invention in such terms that one skilled in the art can make and use the claimed invention is to ensure that the invention is communicated to the interested public in a meaningful way. The information in the specification of the application must be sufficient to inform those skilled in the relevant art how to both make and use the claimed invention. Detailed procedures for making and using the invention may not be necessary if the description of the invention itself is sufficient to permit those skilled in the art to make and use the invention.

As noted in the Background section of the present application, there are numerous mechanisms for patching fiber optic cables from one node to another node and establishing a correlation on

both nodes. Referring to Figure 7A and Figure 8 of the present invention the mating of an optical interconnect/image guide is used to couple the fiber optic array 640 to the substrate array of emitters and detectors. In this particular invention, the array of fiber optics 640 is reconfigurable from one node to the next due to the dedicated receiver reserved scheme. As noted in the specification, "FIG. 8 is an illustration of a larger array, two 4x4 arrays, with emitters 700 and detectors 710 attached to a silicon substrate 720. The mating optical interconnect 730 is positioned to mate and align the ordered fiber array 740 in order to achieve a one-to-one correlation between the ordered fiber array 740 and the emitters 700 and detectors 710. Once mated, the ordered fiber array can be split and bundled to configure different topologies and otherwise direct the optical data in a re-configurable manner." (Page 27, beginning on line 1)

For additional reference, the Applicant refers to Issued Patent 6,434,308 which is incorporated by reference in the present application. A bundle of optical fibers employ an optical interconnect, such as an image guide (see Figure 4 of U.S. Pat. No. 6,434,308) reference number 40 to couple to the arrays of optical transmitters and receivers on the central array. The optical arrays can have any number of optical transmitters and/or receivers and the optical fibers provide the connectivity. This is a well known concept and various implementations are used for mating an optical transmitter on one array to a corresponding optical receiver on another array. The present invention is not limited to any single implementation of coupling the optical fibers to the emitters/detectors but rather to the usage of a dedicated receiver topology and claimed elements as noted in the amended claim.

Claim 11 has been canceled and new claims are included herewith to more clearly articulate the elements of the present invention as described in the specification with respect to coupling of optical communication lines from one node to another node. Applicant respectfully requests that the rejection be withdrawn.

Claims Rejections - 35 USC §112 Second Paragraph

The Office rejected Claims 9, 11-16 under 35 USC 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention. A §112 second paragraph rejection has two separate requirements, indefiniteness and failing to claim what applicant regards as the invention. With respect to indefiniteness, the "essential inquiry pertaining to this requirement is whether the claims set out and circumscribe a particular subject matter with a reasonable degree of clarity and particularity. Definiteness of claim language must be analyzed, not in a vacuum, but in light of (1) the content of the particular disclosure, (2) the teachings of the prior art, and (3) the claim interpretation that would be given by one possessing the ordinary level of skill in the pertinent art at the time the invention was made." (MPEP §2173.02).

A rejection stating that the claims fail to set forth the subject matter that the applicant regards as the invention is only appropriate where the applicant has stated that the invention is something different from what is defined by the claims (MPEP §2172(a)). There is a presumption that the claims describe the applicant's invention, absent evidence to the contrary.

It is important to remember that the Office's focus during examination for compliance of the requirement for definiteness of 112 (second paragraph) is whether the claim meets the threshold requirements of clarity and precision, and not whether more suitable language or modes of expression are available. The essential inquiry pertaining to a rejection under 112 (second paragraph) is whether the claims set out and circumscribe a particular subject matter with a reasonable degree of clarity and particularity. MPEP 2173.02. This is an objective standard because it is not dependent on the views of applicant or any particular individual, but is evaluated in the context of whether the claim is definite – i.e., whether the scope of the claim is clear to a hypothetical person possessing the ordinary level of skill in the pertinent part. MPEP 2171.

On page 3, item No. 5, the Office rejects claim 9 as being indefinite because it recites the limitation 'said array' in line 1 with insufficient antecedent basis. This claim has been canceled and new claims are included with proper antecedent basis. This rejection is traversed.

The Office rejects claim 11 and alleges that it is not clear as to the meaning of "...a means for separating the mating fiber optic cables to enable connection to other fiber optic nodes." This issue is detailed herein and the claim has been canceled to eliminate any confusion. This rejection is traversed.

Claim 15 is also rejected by the Office, wherein the Office alleges that it is not clear as to the meaning of "... said mating fiber optic cables connect to a processing unit off-chip." The Office correctly notes that the specification does describe the off-chip interface but wishes clarification of the limitation. The reference to 'a processing unit off-chip' refers to a processing unit that is located off-chip. Referring to the present application as well as the issued patents U.S. Pat. No. 6,674,971 and U.S. Pat. No. 6,434,308, the fiber interconnects can couple disparate chips and allow optic communications between these chips. As noted in Figure 10B of the present application, a large central node array 955 can be divided into sections and have each of the sections optically coupled to nodes (not shown) by fiber bundles, wherein the nodes are not on the same chip as the central node. The specification also describes that the various nodes coupled to the central node can also be central nodes having processing units. The fibers referenced in the original claims refer to the fiber bundle as detailed herein. Claim 15 has been canceled and new claims are included herewith that more clearly articulate that the processing unit is off-chip, and this rejection is traversed.

Claims Rejections - 35 USC §102(b)

The Office rejected claims 1-2, 4-6, and 9-16 under 35 U.S.C. 102(b) as being anticipated by Delcoco et al (U.S. Pat. No 5,127,067). A rejection based on anticipation requires that a single reference teach every element of the claim (MPEP § 2131). "The identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). Or stated in another way, a "claim is anticipated only if each and every element as set forth in the claim is found, . . . described in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

The invention of Delcoco was considered and cited by the Applicant in the Information Disclosure Statement. In order to appreciate the present invention, a review and comparison to Delcoco helps to illustrate the aspects of the present invention. The Applicant acknowledges the differences already articulated by the Office elsewhere in the Office Action.

Reviewing Delcoco in detail starting with Figure 2, there is a number of nodes 12a-d coupled to an interconnect and switching circuitry 20 via a plurality of unidirectional lines 16. The transmitters of the leaf nodes 18 are shown coupled to receivers of the center node 22a-d and the receivers of the node 19 are shown coupled to the transmitters of the center node 24a-d. However, unlike the receiver reserved protocol of the present invention, Delcoco states that "the receivers 22 must include means for supplying a line status signal indicating communication activity on at least one corresponding transmission line 16 connected to the corresponding node 12. The line status signal is used to determine whether a node should be bypassed." (Col 3, lines 58-66) The data flow from one node to the next is described on Col. 4, lines 1-17, which is the prior manner of communication with the latency described in the present application.

The Office cites Delcoco as describing a receiver reserved protocol in Delcoco Figure 4 and the description in Col 4, lines 32-68. However, Delcoco describes and depicts communications lines for a node having a single transceiver pair mating to a corresponding pair on the central switching section. There is control circuitry, such as encoders and multiplexers that control to data flow depending on the status lines and is primarily concerned with the switching means. More specifically, "[e]ach receiver 22 is connected via a network of electrical signal lines 26 to a group of selective multiplexers 28. Each selective multiplexer 28 supplies transmission data to one of the transmitters 24 in dependence upon the ring protocol and the line status signals received from the receivers 22." Delcoco does not depict or describe any use of multiple transmitters on the nodes nor how such an implementation would be operable. Furthermore, as shown in Delcoco Figure 3 and Figure 4, the circuitry is intended to figure out which node data is received from and which node to send data. In the present invention, any data received by a node

will know the subarray from which it came and data received from a node automatically knows the node from which it came. There are no optical communication lines connected between any of the nodes to transfer optical data. Delcoco employs electro/optical and optical/electro conversions to relay data between nodes. And, the division of the central array of the present invention into subarrays corresponding to the number of nodes is distinguishable from Delcoco. There is no comparable subarray structure in Delcoco, and Delcoco uses electronic circuitry to select the transmitters to send out optical data to a node and received data employs electronic circuitry to define the node from which the data came. As noted in Delcoco Col 4, lines 32-37, “[e]ach receiver 22 is connected via a network of electrical signal lines 26 to a group of selective multiplexers 28. Each selective multiplexer 28 supplies transmission data to one of the transmitters 24 in dependence upon the ring protocol and the line status signals received from the receivers.” Other embodiments include the logic circuitry of Delcoco Figure 5 and switching circuitry of Delcoco Figure 6. Thus, while Delcoco concentrates on switching and control mechanisms, it is distinguished from the dedicated receiver protocol claimed in the present application. Furthermore, even with the control and switching, Delcoco only operates a single transmitter and receiver coupling to a node.

Comparing Figure 4 of the present invention, the receiver reserved protocol does not function in the same manner and is distinguishable on several fronts. Figure 4 of the present invention depicts a ring topology with receivers and transmitters fabricated on a substrate having optical connections to each node – it does not encompass with the interconnect and switching circuitry in the star network coupler of Delcoco nor the functionality of Delcoco. The embodiment of Figure 4 of the present application has a plurality of nodes established on a substrate (see Figure 10a/b) with each node having a dedicated receiver that couples to a dedicated transmitter of another node forming a ring network. The nodes are coupled to each other via optical lines.

Figure 5 of the present invention depicts a central node and multiple leaf nodes, there is a dedicated receiver in each node that is coupled via a relocatable fiber bundle to the central node, wherein the central node is partitioned into subarrays or quadrants for each respective node.

There is only one dedicated receiver per node according to the embodiment of Figure 5 while there is a plurality of transmitters. All data transmitted from the central array to a specific node will be via the dedicated receiver reserved coupling.

Figure 6 of the present invention depicts four dedicated receivers on each node allowing a 4-bit bidirectional bus between the leaf nodes and the central node. The relocatable fiber bundle refers the ability to couple the fiber bundle from any subarray of the central node to any one of the nodes. Delcoco does not show any manner of coupling multiple transmitters and receivers as described in the present application.

Referring again to the Office Action page 4, the Office rejects claims 1 and 11 and states that Delcoco teaches each of the elements of the present invention. Applicant argues that Delcoco does not teach the use of dedicated receivers in each node along with a plurality of transmitters coupled via an optical connection to central node wherein the central node is configured into subarrays corresponding to the number of nodes. Claim 1 has been canceled and the new claims more clearly articulate the patentable subject matter of the invention.

The independent claims 17 and 28 are presented herein for convenience to the Office:

17. (New) A network device for optical data communications, comprising:
 - a central array comprised of a plurality of central node transmitters and a plurality of central node receivers, wherein said central array is divided into at least one subarray;
 - at least one secondary node comprised of at least one dedicated secondary node receiver and a plurality of secondary node transmitters, wherein each said secondary node is coupled to each said subarray;
 - a plurality of optical communications lines coupling said central array and said secondary node; and

a means for processing said optical data using a receiver reserved protocol wherein each said secondary node receives said optical data only on said dedicated secondary node receiver.

28. (New) A reconfigurable optical data communications topology, comprising:
- a central optoelectronic array divided into a plurality of subarrays, each of said subarrays having a plurality of central array emitters and a plurality of central array detectors, wherein said central array emitters and central array detectors are fabricated onto a substrate and coupled to electronic circuitry;
 - an ordered fiber array comprising a plurality of fiber optic cables that are coupled on a first end of said fiber optic cables to said central array emitters and said central array detectors, and wherein said ordered fiber array is divided into a plurality of fiber optic bundles at a second end; and
 - a plurality of nodes with at least one dedicated node detector and more than one node emitter, wherein said node emitter and node detector of each said nodes are optically coupled to said subarrays by said second end of said fiber optic cables, and wherein said central array communicates with said nodes using a receiver reserved protocol.

The Applicant believes the independent claims provided herein possess elements that are distinguished from the cited art and respectfully requests reconsideration and allowance.

Regarding the rejection of claim 2, this claim has been canceled, however it should be noted that while Delcoco shows a one-to-one correspondence in Delcoco Figure 2, this is not a receiver reserved protocol as defined in the present application and Delcoco does not support multiple transmitters or receivers on the same node. The present invention as claimed employs more than one transmitter along with a dedicated node receiver. With respect to the rejection of claim 4, the claim has been canceled, but as explained herein, Delcoco does not divide a central array into a plurality of emitters/detectors forming subarrays as described in the present application.

Claims 1-2, 4-6, and 9-16 have been canceled and Applicant respectfully requests reconsideration and allowance of the new claims 17-35. Independent claim 17 and 28 more clearly articulate the patentable subject matter and the dependent claims further articulate limitations of those claims.

Claim Rejections – 35 USC § 103

The Office has quoted the statute from 35 USC 103(a), which is referenced herein. The Office has rejected claim 3, 7-8 as being unpatentable over Delcoco (U.S. Pat. No 5,127,067) in view of other references. Applicant has carefully considered the Office rejections and respectfully submits that the new claims, as supported by the arguments herein, are distinguishable from the references.

According to the MPEP §2143.01, "[o]bviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found in either the references themselves or in the knowledge generally available to one of ordinary skill in the art." A useful presentation for the proper standard for determining obviousness under 35 USC §103(a) can be illustrated as follows:

1. Determining the scope and contents of the prior art;
2. Ascertaining the differences between the prior art and the claims at issue;
3. Resolving the level of ordinary skill in the pertinent art; and
4. Considering objective evidence present in the application indicating obviousness or unobviousness.

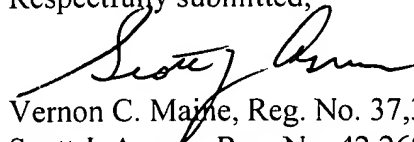
The Office rejected Claim 3 under 35 USC 103(a) as being unpatentable over Delcoco (U.S. Pat. No 5,127,067) in view of Husbards (U.S. Pat. No 4,781,427). The Applicant contends that the transmitters such as Vertical channel surface emitting lasers (VCSELs), light emitting diodes (LEDs) and Resonant Cavity Light Emitting Diode (RCLED) represent further limitations of the invention and would be allowable based upon an allowable independent claim.

Claims 7 and 8 are rejected under 35 USC 103(a) as being unpatentable over Delcoco (U.S. Pat. No 5,127,067) in view of Johnson (U.S. Pat. No 5,903,370) or Wu Johnson (U.S. Pat. No 5,442,623). In particular, the Office states that Johnson and Wu teach secondary nodes that are

themselves central arrays or a combination of central arrays and leaf nodes. Applicant submits that there are numerous topologies in the art with respect to underlying designs. However the elements that comprise the present invention are distinguishable from those in the art such that a receiver reserved implementation of a tree topology is distinguishable from other tree structures. The present application shows a number of acknowledged prior art networks in Figures 1-3B showing linear bus networks, ring networks, and star networks. The present invention illustrates that the star network using the receiver reserved protocol is reconfigurable in various manners as shown in Figures 9A-C. The present invention facilitates the division of large arrays into smaller arrays. It provides the ability of the individual leaf nodes to communicate with a central node over a multi-bit bus by using the receiver reserved protocol. The dependent claims related to the various topologies that can be implemented using the teachings of the present invention represent a limitation that would be allowable based upon an independent claim. The use of fiber bundles allow the central array to communicate with other central arrays or nodes on the same chip or at some distant from the central array chip and still maintain the optical processing speed and bandwidth. Claims 7 and 8 have been canceled, however as explained herein, the elements of those claims represent further limitations of the invention. Applicant respectfully requests reconsideration of all claims and allowance.

Applicant believes the above amendments and remarks to be fully responsive to the Office Action, thereby placing this application in condition for allowance. No new matter is added. Applicant requests speedy reconsideration, and further requests that Examiner contact its attorney by telephone, facsimile, or email for quickest resolution, if there are any remaining issues.

Respectfully submitted,



Vernon C. Maine, Reg. No. 37,389
Scott J. Asmus, Reg. No. 42,269
Neil F. Maloney, Reg. No. 42,833
Andrew P. Cernota, Reg. No. 52,711
Attorneys/Agents for Applicant

Cus. No. 24222
Maine & Asmus
PO Box 3445
Nashua, NH 03061-3445
Tel. No. (603) 886-6100, Fax. No. (603) 886-4796
Info@maineandasmus.com